the roadside exposed to direct solar radiation. Examination of the site and of the meteorological records showed that, during the winter of 1964–65, most of the snow cover had been removed during a period of 4 days, when air temperatures rose to nearly 40°F. A period of subzero weather followed almost immediately, lowering air temperatures to −38°F. No such quick fluctuations were recorded or observed the following year; no mortality of eggs was evident.

Eggs of three species of grasshopper, therefore, did suffer high egg mortality during winter months of various years at certain locations in Saskatchewan. Winter mortality is directly related to some of the weather factors operative at these sites. Whether these factors operate singly or in combination with one another, they create conditions that are unfavourable for survival of grasshopper eggs.

A study of the time–temperature relationships of subzero cold as factors in the killing of grasshopper eggs is now underway in the laboratory to define the role played by cold in winter mortality of eggs.

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MEXICAN GEOTRUPINI: A NEW SPECIES OF *GEOTRUPES* AND DESCRIPTION OF THE LARVA OF *CERATOTRUPES* (COLEOPTERA: SCARABAEIDAE)[1]

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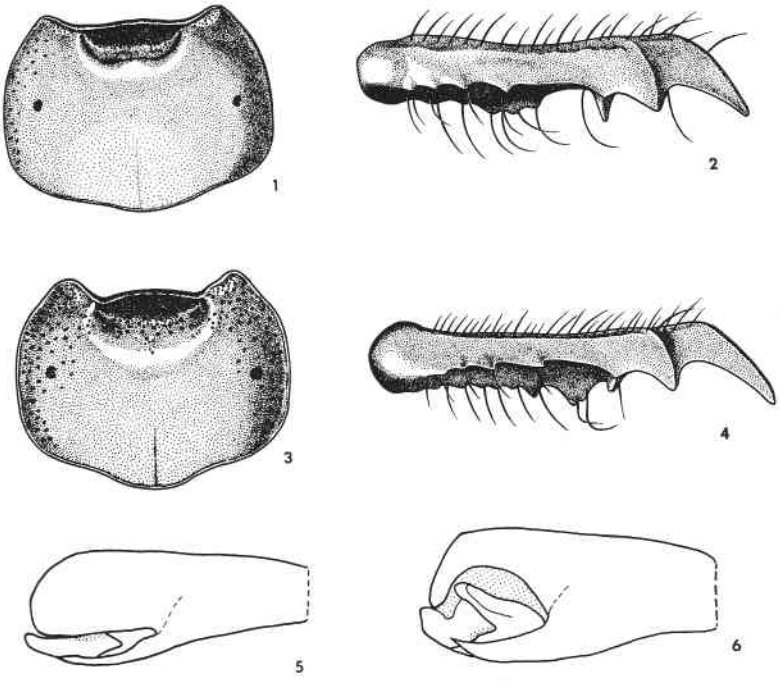
Abstract *Can. Ent.* 99: 1003–1007 (1967)

A new species, *Geotrupes* (*Geotrupes*) *fisheri*, from Nevada de Colima, Jalisco, Mexico, is described and compared with the related *Geotrupes cavicollis* Bates. Figures and a description of the larva of *Ceratotrupes bolivari* Halffter and Martinez are included, along with notes on its biology.

The species of *Geotrupes* described below will key out to *Geotrupes cavicollis* Bates in "The Geotrupinae of North and Central America" (Howden 1964). *Geotrupes cavicollis* and the new species are the only New World representatives of the subgenus *Geotrupes*. They may be separated from all other New World *Geotrupes* by the morphology of the antennal club, the ventral portion of the second segment being partly enclosed (hidden) by the first and third segments. Since this character is sufficient to distinguish these two species from related New World forms, the subsequent description includes only those characters which will distinguish the new species from *Geotrupes cavicollis* Bates.

[1]Written while Alexander Agassiz Visiting Lecturer, Museum of Comparative Zoology, Harvard University, Cambridge, Mass.



FIGS. 1–6. *Geotrupes* spp.: 1, *G. cavicollis* Bates, pronotum; 2, *G. cavicollis* Bates, right fore tibia; 3, *G. fisheri* new species, pronotum; 4, *G. fisheri* new species, right fore tibia; 5, *G. cavicollis* Bates, lateral view of male genitalia; 6, *G. fisheri* new species, lateral view of male genitalia.

***Geotrupes* (*Geotrupes*) *fisheri* new species**

(Figs. 3, 4, 6)

Holotype

Male, length 27.0 mm, greatest width 15.5 mm. Antennal club reddish, second segment ventrally emarginate and reduced in thickness; as in *cavicollis* but with the club, in lateral view, slightly more oval. Clypeus as in *cavicollis*, but with larger median tubercle. Pronotum with deep concavity behind anterior margin (Fig. 3), much larger than in *cavicollis* (Fig. 1); concavity slightly wider than head and occupying anterior third of pronotum near the midline; punctures present anteriorly and laterally (Fig. 3), more pronounced than in *cavicollis* (Fig. 1). Elytra with striae distinctly impressed, the intervals more convex than in *cavicollis*. Fore tibia (Fig. 4) with transverse tooth behind and beneath penultimate tooth and with a rounded, irregular row of teeth in median, ventral third [in *cavicollis* (Fig. 2) the first ventral tooth is larger and distinctly separated from the rounded, ventral teeth in basal half]. Basal fourth of hind femur with punctures more pronounced than in *cavicollis*. Genitalia (Fig. 6) with apices of dorsal lobes slender, not broadly rounded as in *cavicollis* (Fig. 5).

Allotype

Female, length 26.0 mm; greatest width 15.5 mm. Differing from females of *cavicollis* in the following respects: antennal club slightly more oval; median clypeal tubercle larger; anterior pronotal concavity longer, wider, and deeper; pronotal punctures more pronounced laterally and anteriorly; elytral striae slightly deeper, intervals more convex.

Type Material

Holotype, male, Nevada de Colima, 8000 ft, Jalisco, Mexico, 27 June 1965, E. M. Fisher (CNC No. 9494). Allotype, female, same data as holotype (CNC No. 9494). Paratypes, 45 males, 50 females; all same locality and collector as holotype, collected 24–27 June 1965, some specimens taken at blacklight. Paratypes are deposited in the following collections: CAS, CNC, Calif. State College (Long Beach), Los Angeles County Museum, MCZ, Eric M. Fisher, Alan R. Hardy, and David S. Verity.

Remarks

Variation is mainly evident in size. Males range from 19.5 to 27.0 mm in length and from 11.0 to 16.0 mm in greatest width. Females vary from 22.0 to 26.0 mm in length and from 12.5 to 16.0 mm in greatest width. In small males (under 23 mm in length) the teeth on the ventral surface of the fore tibia are greatly reduced, the large ventral anterior tooth being represented by a small transverse carina under the third lateral tooth (this tooth is absent in large males).

The species is named for Mr. E. M. Fisher, California State College, Long Beach, Calif., who collected the entire series and who kindly allowed me to retain the type in the Canadian National Collection at Ottawa.

Ceratotrupes bolivari Halffter and Martinez, third stage larva

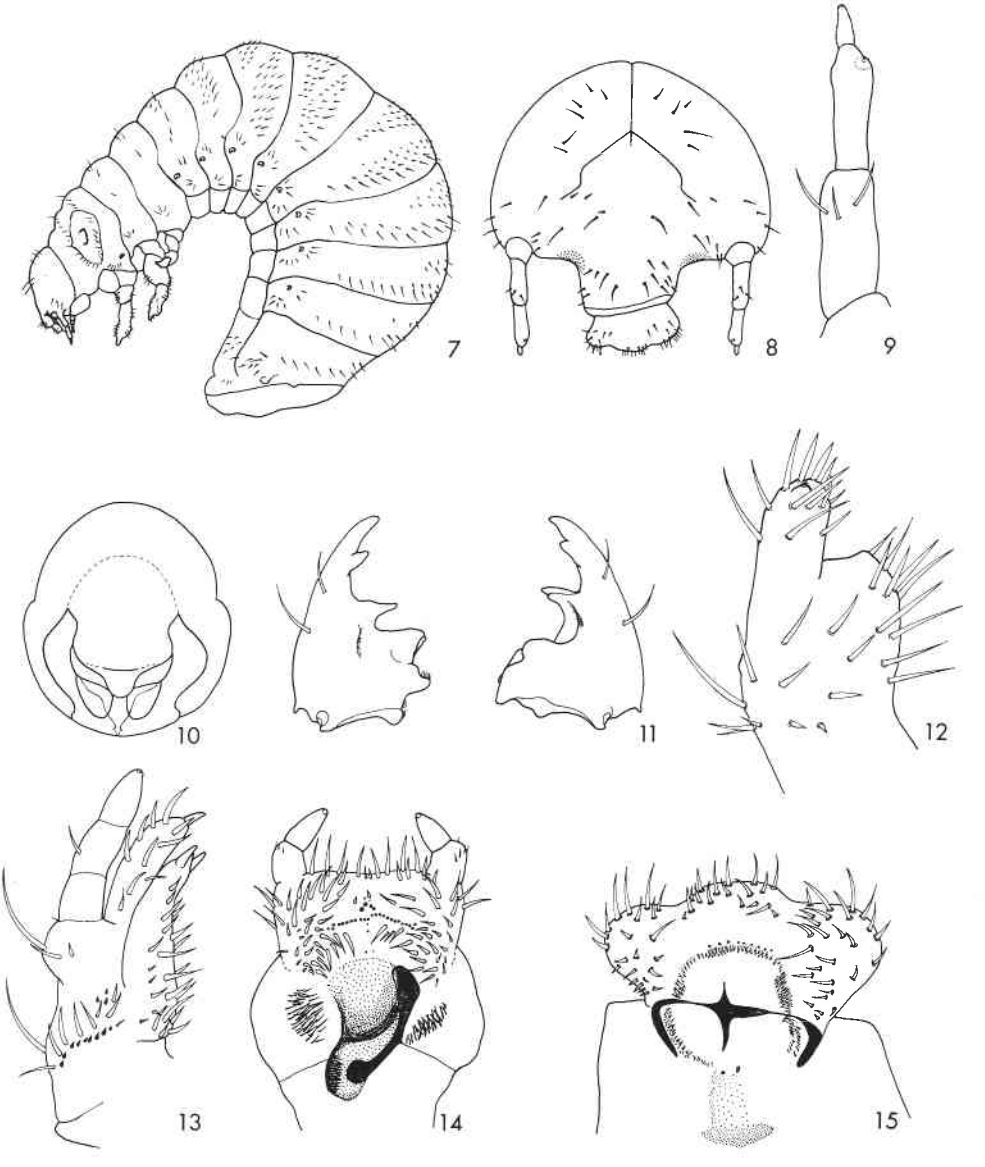
(Figs. 7–15)

Description based on a single third stage larva from 10 miles W. El Salto, Durango, Mexico.

Maximum width of head capsule 4.6 mm. Frons (Fig. 8) on each side with one or two posterior frontal setae, three setae at each anterior angle, one or two anterior frontal setae, and one or two exterior frontal setae. Clypeal–frontal suture absent. Clypeus asymmetrical, labrum trilobed. Antenna (Fig. 9) with third segment greatly reduced in diameter, 0.44 times as long as second segment. Mandibles (Fig. 11) with scissorial area nearly asymmetrical, being very similar in general configuration to mandibles of the larva of *Geotrupes splendida* (Howden 1955, Plate 7, Figs. 13, 14). Left maxilla (Fig. 13) with stridulating area having nine conical teeth on stipes and three near posterior margin of palpifer. Glossa (Fig. 14) slightly and broadly emarginate. Hypopharynx (Fig. 14) with right oncylus larger and better developed than left oncylus. Epipharynx (Fig. 15) very similar to a number of species of North American *Geotrupes*, but with two sensillae and a lightly sclerotized area behind the posterior epitorma; chaetoparia on each side composed of 23 to 26 setae.

Body of larva (Fig. 7) similar in shape to *Geotrupes* larva. Anterior thoracic segment on each side with a poorly defined dorsolateral plate, this with a distinct median concavity. Second to seventh abdominal segments with two poorly defined dorsal annulets. Anal lobes (Fig. 10) largely obscuring a poorly defined, angulately expanded endoskeletal figure. Prothoracic and mesothoracic legs each with the terminal segment (Fig. 12) bearing a small apical tubercle. Metathoracic legs reduced in size as in *Geotrupes*, each leg with 12 or 13 stridulatory teeth on anterior, inner surface.

The larva of *Ceratotrupes bolivari* will key out to the genus *Geotrupes* in my key to the genera of North American Geotrupinae larvae (1955, p. 163). *Ceratotrupes* seemingly can be separated (based on the single larva) from *Geotrupes* by the shape of the anal lobes and the distinctive hypopharynx.



FIGS. 7–15. *Ceratotrupes bolivari* Halffter and Martinez, third stage larva: 7, lateral view; 8, head; 9, left antenna; 10, caudal view of last abdominal segment; 11, mandibles; 12, terminal segment of right mesothoracic leg; 13, dorsal view of left maxilla; 14, dorsal view of labium and hypopharynx; 15, epipharynx.

In most of the larval characters, *Ceratotrupes* seems to be much more closely allied to *Geotrupes* than it is to *Peltotrupes* or *Mycotrupes*. However, the habits of *Ceratotrupes* indicate a considerable divergence from typical *Geotrupes* behavior. During the summer of 1964 I had the opportunity of collecting and observing *Ceratotrupes bolivari* in an area approximately 10 miles west of El Salto, Durango, Mexico, at an elevation of 8500 ft. In this area the summer rains started in late June and by mid-July adult *Ceratotrupes bolivari* were not uncommon around cow dung. Also, in the early evening, they came in some numbers to a 15-w blacklight. Several pairs of adults were confined in 1-gal cans nearly filled with the local clay soil. Moderately fresh (1-week-old) cow dung was added at 2-week periods. On 1 August 1964 several of the cans yielded "cells" of dung. These were, in most cases, contiguous to the bottom of the can, and were approximately 3 in. long. Initially I was puzzled by the lack of an egg cavity at the terminal end of the dung cell, since all other North American Geotrupini place their eggs in this manner. I then noticed an egg in the soil beside the dung. Further (and more careful) excavation yielded other dung "cells", each with a cavity containing the egg in the soil near the terminus of the dung mass (members of the genus *Bolbocerus*, tribe Bolboceratini, also place the egg in a cavity adjacent to, but not in, the food cell). The shape of the *Ceratotrupes* egg is typical for the Geotrupini: oval (larger at one end). Two eggs hatched on 1 August. One first instar died within a week. The other was preserved as a large third instar on 3 October 1964. Several other eggs failed to hatch, presumably killed by heat when they were moved from the El Salto area. In addition to confining adults in cans, several attempts were made to locate brood chambers in the field, but without success. A number of adult burrows were found under relatively old deposits of cow dung, but these all contained the adults in seemingly incomplete burrows. In other cases, tree roots or other obstacles made excavation impossible. The burrows that were excavated and contained adults ranged from 8 to 14 in. in depth.

Acknowledgments

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